THIS OPINION WAS NOT WRITTEN FOR PUBLICATION

The opinion in support of the decision being entered today (1) was not written for publication in a law journal and (2) is not binding precedent of the Board.

Paper No. 24

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte V. DURGA NAGESWAR RAO, DANIEL MICHAEL KABAT
and
HARRY ARTHUR CIKANEK

Appeal No. 96-3202
Application No. 08/183,464[1]

ON BRIEF

Before McCANDLISH, Senior Administrative Patent Judge, and MEISTER and NASE, Administrative Patent Judges.

NASE, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal from the examiner's final rejection of claims 1 through 20, which are all of the claims pending in this application.

[1] Application for patent filed January 19, 1994. According to the appellants, the application is a continuation-in-part of Application No. 07/795,320, filed November 12, 1992, now abandoned.

We AFFIRM and enter new rejections pursuant to 37 CFR § 1.196(b).

BACKGROUND

The appellants' invention relates to a low friction valve train. Claims 1, 14 and 20 are representative of the subject matter on appeal and copies of those claims are attached to this decision.

The prior art references of record relied upon by the examiner as evidence of obviousness under 35 U.S.C. § 103 are:

Melling	3,303,833	Feb. 14, 1967
Behnke	4,153,017	May 8, 1979
Buente	4,367,701	Jan. 11, 1983
Oda	4,871,266	Oct. 3, 1989
Rao et al. (Rao)	4,872,432	Oct. 10, 1989
Shiraya et al. (Shiraya)	4,909,198	Mar. 20, 1990
Allor et al. (Allor)	4,995,281	Feb. 26, 1991
Purnell et al. (Purnell)	5,041,168	Aug. 20, 1991
Tanaka et al. (Tanaka)	2,242,240 (UK)	Sep. 25, 1991

Claims 1 through 20 stand rejected under 35 U.S.C. § 112, first paragraph, as the specification fails to adequately teach how to make the invention.

Claims 1 through 6, 9, 14 through 17, 19 and 20 stand rejected under 35 U.S.C. § 103 as being unpatentable over Oda, Shiraya, Rao and Tanaka.

Claims 7 and 18 stand rejected under 35 U.S.C. § 103 as being unpatentable over Oda, Shiraya, Rao, Tanaka and Purnell.

Claim 8 stands rejected under 35 U.S.C. § 103 as being unpatentable over Oda, Shiraya, Rao, Tanaka and Behnke.

Claims 10 and 12 stand rejected under 35 U.S.C. § 103 as being unpatentable over Oda, Shiraya, Rao, Tanaka and Buente.

Claim 11 stands rejected under 35 U.S.C. § 103 as being unpatentable over Oda, Shiraya, Rao, Tanaka, Buente and Allor.

Claim 13 stands rejected under 35 U.S.C. § 103 as being unpatentable over Oda, Shiraya, Rao, Tanaka and Melling.

Rather than reiterate the conflicting viewpoints advanced by the examiner and the appellants regarding the § 112 and § 103 rejections, we make reference to the final rejection (Paper No. 11, mailed January 6, 1995) and the examiner's answer (Paper No. 20, mailed March 4, 1996) for the examiner's complete reasoning in support of the rejections, and to the appellants' brief (Paper No. 19, filed December 4, 1995) and reply brief (Paper No. 21, filed April 8, 1996) for the appellants' arguments thereagainst.

OPINION

In reaching our decision in this appeal, we have given careful consideration to the appellants' specification and claims, to the applied prior art references, and to the respective positions articulated by the appellants and the

examiner. As a consequence of our review, we make the determinations which follow.

The enablement issue

We will not sustain the rejection of claims 1 through 20 under 35 U.S.C. § 112, first paragraph.

An analysis of whether the claims under appeal are supported by an enabling disclosure requires a determination of whether that disclosure contained sufficient information regarding the subject matter of the appealed claims as to enable one skilled in the pertinent art to make and use the claimed invention. The test for enablement is whether one skilled in the art could make and use the claimed invention from the disclosure coupled with information known in the art without undue experimentation. See United States v. Telectronics, Inc., 857 F.2d 778, 785, 8 USPQ2d 1217, 1223 (Fed. Cir. 1988), cert. denied, 109 S.Ct. 1954 (1989); In re Stephens, 529 F.2d 1343, 1345, 188 USPQ 659, 661 (CCPA 1976).

In order to make a rejection, the examiner has the initial burden to establish a reasonable basis to question the enablement provided for the claimed invention. See In re Wright, 999 F.2d 1557, 1561-62, 27 USPQ2d 1510, 1513 (Fed. Cir. 1993) (examiner must provide a reasonable explanation as to why the scope of protection provided by a claim is not adequately enabled by the disclosure).

Thus, the dispositive issue is whether the appellants' disclosure, considering the level of ordinary skill in the art as of the date of the appellants' application, would have enabled a person of such skill to make the appellants' invention without undue experimentation. The threshold step in resolving this issue as set forth supra is to determine whether the examiner has met his burden of proof by advancing acceptable reasoning inconsistent with enablement. This the examiner has not done.

For the reasons set forth in the appellants' brief (p. 10) and reply brief (pp. 2-3), it is our opinion that the appellants' original disclosure would have enabled a person of

ordinary skill in the art to make the appellants' claimed invention without undue experimentation. Additionally, with respect to claims 1, 6 through 14, 18 and 19, the original disclosure enabled a person of ordinary skill in the art to make the appellants' claimed invention without undue experimentation by the disclosure (p. 10) that the solid film lubricant 50 may also be a metal matrix composite having about 40% graphite and the remainder aluminum or cast iron.

The obviousness issue

The test for obviousness is what the combined teachings of the references would have suggested to one of ordinary skill in the art. See In re Young, 927 F.2d 588, 591, 18 USPQ2d 1089, 1091 (Fed. Cir. 1991) and In re Keller, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981). Moreover, in evaluating such references it is proper to take into account not only the specific teachings of the references but also the inferences which one skilled in the art would reasonably be expected to draw therefrom. In re Preda, 401 F.2d 825, 826, 159 USPQ 342, 344 (CCPA 1968).

The appellants have provided three groups of claims as follows: Group I, claims 1 through 13; Group II, claims 14 through 19; and Group III, claim 20. See pages 7-8 of the appellants' brief. In accordance with 37 CFR § 1.192(c)(7), we have selected claims 1, 14 and 20 from the appellants' three groups of claims to decide the appeal on the rejections under
35 U.S.C. § 103.

Claim 1

We will sustain the rejection of claim 1 under 35 U.S.C. § 103.

Independent claim 1 sets forth a low friction valve train comprising, inter alia, a cam shaft having a cam and a tappet which contacts the cam and a valve. The cam and tappet each has an outer surface with an open porosity and a solid film lubricant, stable to temperatures at about 700°F., is impregnated and anchored in the open porosity of the outer surface of the cam and tappet.

As shown in Figure 2, Oda discloses a tappet cam assembly including a metal cam 11 and a ceramic tappet 13. The outer surface of the metal cam 11 is coated with a solid lubricant and a binder 12 to provide excellent wear-resisting and friction-resisting performances can be obtained even at high temperature with dry conditions in which engines are used.[2]

As shown in Figure 1, Shiraya discloses an aluminum alloy valve lifter (i.e., tappet) composed of a valve lifter body 1 made of Al-Si type alloy and consisting of a cylindrical portion 2 and a disc portion 3, an Fe-C type coating 4 sprayed on the peripheral surface of the cylindrical portion 2, a wear-resistant chip 5 fixed to the underside of the disc portion 3, and an adjusting shim 6 set on the upper surface of the disc portion 3. An end of a valve rod (not shown) impinges on the wear-resistant chip 5, and a cam (not shown) comes into contact with the

[2] See column 5, lines 32-35, and column 6, lines 3-11, of Oda.

adjusting shim 6. The portion 2 has a ring ridge part 7 surrounding the shim 6.[3] Figure 22 is a partly enlarged sectional view of an aluminum alloy valve lifter body wherein a sprayed coating 4 is shown as being impregnated and anchored in the open porosity of the cylindrical portion 2.[4]

Rao discloses to decrease the friction between an annular body 20 on a piston 13 and an opposing cylinder wall 12, a solid film lubricant coating 35 (see Figure 6) containing either BN or MoS_2 with graphite may be applied to the cylinder wall. Rao teaches that this coating is comprised of about 40% by weight of high temperature thermoplastic resin such as polyarylsulfone, 40% graphite, and 20% of either MoS_2 or BN. Rao further discloses that a resin that is thermally stable up to about 700°F. is polymer 360, known as Astrel, manufactured by Minnesota Mining and Manufacturing Company. Rao teaches that after the cylinder wall surface is thoroughly cleaned to remove any oxidation, such wall may be grit blasted

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[3] See column 7, lines 23-35, of Shiraya.

[4] See column 7, lines 6-8, and column 16, lines 9-21, of Shiraya.

to increase porosity and thereby the reception of the coating.[5] Rao discloses that BN will break down as a structural solid at about 750°F. and MoS_2 will do so at about 600°F. Rao further teaches that to permit such substances to continue providing antifriction characteristics after such breakdown, the supporting surface may be provided with reservoirs 43 or grooves to capture or retain the solid film lubricant coating 44, much in the manner of porosity.[6]

Tanaka discloses a sliding bearing material with an outer porous metal layer having a composition impregnated into the pores thereof. The composition can contain from 0.5 to 30% by volume a solid lubricant such as graphite.[7]

After the scope and content of the prior art are determined, the differences between the prior art and the

[5] See column 6, lines 10-28, of Rao.

[6] See column 6, lines 48-57, of Rao.

[7] See page 5, line 14 , to page 6, line 6, of Tanaka.

claims at issue are to be ascertained. Graham v. John Deere Co., 383 U.S. 1, 17-18, 148 USPQ 459, 467 (1966).

The differences between Shiraya and claim 1 are the limitations that (1) the cam is mounted on a cam shaft, (2) a solid film lubricant is impregnated and anchored in the porosity of the outer surface of the cam, and (3) the solid film lubricant on the outer surfaces of the cam and the tappet being stable to temperatures at about 700°F. to retain a low coefficient of friction and promote rapid formation of a stable oil film to reduce friction.

In applying the above noted test for obviousness, we reach the conclusion that it would have been obvious to one of ordinary skill in the art at the time of the appellants' invention to
mount Shiraya's cam on a cam shaft and to provide the outer surface of the cam with a solid film lubricant in order to achieve excellent wear-resisting and friction-resisting performance even at high temperature with dry conditions in which engines are used as suggested by Oda. Additionally, it

would have been obvious to one of ordinary skill in the art at the time of the appellants' invention to utilize the solid film lubricant of Rao[8] (which impregnates the surface) for the solid film lubricant on the outer surfaces of the cam and the tappet to further decrease friction.

The arguments advanced by the appellants (brief, pp. 14-18 and reply brief, pp. 3-4) do not persuade us that claim 1 is unobvious over the applied prior art for the following reasons. First, as to the appellants arguments regarding the deficiencies of each reference on an individual basis, we note that nonobviousness cannot be established by attacking the references individually when the rejection is predicated upon a combination of prior art disclosures. See In re Merck & Co. Inc., 800 F.2d 1091, 1097, 231 USPQ 375, 380 (Fed. Cir. 1986). Lastly, the appellants argue that there is no suggestion to

[8] Particularly since the solid film lubricant disclosed by Rao is basically the same as the solid film lubricant disclosed by the appellants, there is a reasonable basis to conclude that the solid film lubricant 35 of Rao is inherently stable to temperatures at about 700°F. to retain a low coefficient of friction and promote rapid formation of a stable oil film to reduce friction.

combine the references absent the application of impermissible hindsight. However, it is our opinion as set forth above that the applied prior art does provide the suggestion or motivation to make the selection made by the appellants. The extent to which such suggestion must be explicit in, or may be fairly inferred from, the references, is decided on the facts of each case, in light of the prior art and its relationship to the appellants' claimed invention. It is our determination that Oda and Rao suggest the desirability, and thus the obviousness, of modifying Shiraya to make the claimed combination.

Claim 14

We will sustain the rejection of claim 14 under 35 U.S.C. § 103.

Claim 14 sets forth the same basic elements as claim 1. In addition claim 14 recites that the cam has a base portion and a lobe portion and the solid film lubricant is impregnated and anchored in the porosity of the surfaces of the base

portion and the lobe portion of the cam. Thus, the differences between Shiraya and claim 14 are the same as recited above with respect to claim 1 with the additional difference being the cam has a base portion and a lobe portion in which the solid film lubricant is impregnated and anchored in the porosity of the surfaces of the base portion and the lobe portion of the cam.

In applying the above noted test for obviousness, we reach the conclusion that it would have been obvious to one of ordinary skill in the art at the time of the appellants' invention to
mount Shiraya's cam on a cam shaft, to provide Shiraya's cam with a base portion and a lobe portion and to provide the outer surface of the cam (i.e., the base portion and the lobe portion) with a solid film lubricant as suggested by Oda to provide excellent wear-resisting and friction-resisting performance even at high temperature with dry conditions in which engines are used. Additionally, it would have been obvious to one of ordinary skill in the art at the time of the appellants' invention to utilize the solid film lubricant of

Rao[9] (which impregnates the surface) for the solid film lubricant on the outer surfaces of the cam (i.e., the base portion and the lobe portion) and the tappet to further decrease friction as set forth above with respect to claim 1.

The arguments advanced by the appellants (brief, pp. 19-22 and reply brief, pp. 3-4) does not persuade us that claim 14 is unobvious over the applied prior art for the reasons stated above with respect to claim 1.

Claims 2 through 13 and 15 through 19

As set forth previously, the appellants have grouped claims 1 through 13 as standing or falling together and claim 14 through 19 as standing or falling together. Thereby, in accordance with 37 CFR § 1.192(c)(7), dependent claims 2 through 13 fall with independent claim 1 and dependent claims 15 through 19 fall with independent claim 14. Thus, it follows that the examiner's rejections of claim 2 through 13 and 15 through 19 under

[9] Id.

35 U.S.C. § 103 are also sustained.

Claim 20

We will sustain the rejection of claim 20 under 35 U.S.C. § 103.

The differences between Shiraya and claim 20 are the limitations that (1) the cam is mounted on a cam shaft, (2) a solid film lubricant is impregnated in the porosity of the outer surface of the cam, and (3) the solid film lubricant is comprised of graphite and at least one of boron nitride and molybdenum disulfide in either one of a high temperature polymer and epoxy base, the solid film lubricant has an affinity for oil and promotes rapid formation of a stable oil film.

In applying the above noted test for obviousness, we reach the conclusion that it would have been obvious to one of ordinary skill in the art at the time of the appellants' invention to

mount Shiraya's cam on a cam shaft and to provide the outer surface of the cam with a solid film lubricant as suggested by Oda to provide excellent wear-resisting and friction-resisting performance even at high temperature with dry conditions in which engines are used. Additionally, it would have been obvious to one of ordinary skill in the art at the time of the appellants' invention to utilize the solid film lubricant comprised of graphite and at least one of boron nitride and molybdenum disulfide in either one of a high temperature polymer and epoxy base of Rao[10] (which impregnates the surface) for the solid film lubricant on the outer surfaces of the cam and the tappet to further decrease friction as set forth above with respect to claim 1.

The arguments advanced by the appellants (brief, pp. 23-24 and reply brief, pp. 3-4) does not persuade us that claim

[10] Particularly since the solid film lubricant disclosed by Rao is basically the same as the solid film lubricant disclosed by the appellants, there is a reasonable basis to conclude that the solid film lubricant 35 of Rao inherently has an affinity for oil and promotes rapid formation of a stable oil film to reduce friction.

20 is unobvious over the applied prior art for the reasons stated above with respect to claim 1.

New grounds of rejection

Inasmuch as the basic thrust of our affirmance of the 35 U.S.C. § 103 rejections of claims 1 through 20 differs from the rationale advanced by the examiner for the rejection, we hereby designate the affirmance to be new grounds of rejection pursuant to 37 CFR § 1.196(b) to allow the appellants a fair opportunity to react thereto (see In re Kronig, 539 F.2d 1300, 1302-03, 190 USPQ 425, 426-27 (CCPA 1976)).

CONCLUSION

To summarize, the decision of the examiner to reject claims 1 through 20 under 35 U.S.C. § 112, first paragraph, is reversed and the decision of the examiner to reject claims 1 through 20 under 35 U.S.C. § 103 is affirmed, with the

affirmance constituting new grounds of rejection under 37 CFR § 1.196(b).

Since at least one rejection of each of the appealed claims has been affirmed, the decision of the examiner is affirmed.

Any request for reconsideration or modification of this decision by the Board of Patent Appeals and Interferences based upon the same record must be filed within one month from the date of the decision. 37 CFR § 1.197. Should the appellants elect to have further prosecution before the examiner in response to the new rejections under 37 CFR § 1.196(b) by way of amendment or showing of facts, or both, not previously of record, a shortened statutory period for making such response is hereby set to expire two months from the date of this decision.

No period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED; 37 CFR § 1.196(b)

HARRISON E. McCANDLISH, Senior Administrative Patent Judge	)
JAMES M. MEISTER Administrative Patent Judge	) BOARD OF PATENT APPEALS AND INTERFERENCES
JEFFREY V. NASE Administrative Patent Judge	)

Appeal No. 96-3202
Application No. 08/183,464

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APPENDIX

1. A low friction valve train actuating at least one valve in an internal combustion engine comprising:

a cam shaft having at least one cam; and

a tappet contacting said at least one cam and valve, said at least one cam and tappet having outer surfaces with an open porosity; and

a solid film lubricant impregnated and anchored in said open porosity, said solid film lubricant being stable to temperatures at about 700°F to retain a low coefficient of friction and promote rapid formation of a stable oil film to reduce friction therebetween in an oil starved environment.

14. A low friction valve train actuating at least one valve in an internal combustion engine comprising:

a cam shaft having at least one cam with a base portion and lobe portion, said base and lobe portions having outer surfaces treated such that the treated surfaces have an open porosity;

a tappet having an outer surface treated such that the treated surface has an open porosity, said tappet further including a wear resistant insert secured to said tappet and contacting said at least one cam; and

a solid film lubricant impregnated and anchored in said open porosity of said treated surfaces of said base portion and said lobe portion and said tappet, said solid film

lubricant being stable to temperatures at about 700°F to retain a low coefficient of friction and promote rapid formation of a stable oil film to reduce friction therebetween in an oil starved environment.

20. A low friction valve train actuating at least one valve in an internal combustion engine comprising:

a cam shaft having at least one cam; and

a tappet contacting said at least one cam and valve, said at least one cam and tappet having outer surfaces with an open porosity and are impregnated with a solid film lubricant comprised of graphite and at least one of boron nitride and molybdenum disulfide in either one of a high temperature polymer and epoxy base, the solid film lubricant has an affinity for oil and promotes rapid formation of a stable oil film to reduce friction therebetween.

APPEAL NO. 96-3202 - JUDGE NASE
APPLICATION NO. 08/183,464

APJ NASE

APJ MEISTER

APJ McCANDLISH

DECISION: **AFFIRMED; 1.196(b)**

Prepared By: Delores A. Lowe

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